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# SCIENCE

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## RECENT PROGRESS IN AERONAUTICS<sup>1</sup>

THERE are two general classes of vehicles of the air, (a) those which depend for their support upon the buoyancy of some gas lighter than air, and (b) those which depend for such support upon the dynamic reaction of the air itself. These classes are designated:

- (a) Lighter-than-air types:  
Free balloons, dirigible balloons or airships.
- (b) Heavier-than-air types:  
Aeroplanes, orthopters, helicopters, etc.

It should be remarked, however, that these two general classes exhibit a growing tendency to overlap each other. For example, the latest dirigible balloons are partly operated by means of aeroplane surfaces, and are also often balanced so as to be slightly heavier than the air in which they move, employing the propeller thrust and rudder surfaces to control the altitude.

### I. AEROSTATION

Captive and free balloons, with the necessary apparatus and devices for operating the same, have been for many years considered an essential part of the military establishment of every first-class power. They played a conspicuous part in the siege of Paris, and were often valuable in our own civil war. The construction and operation of aerostats are too well understood to need further attention here.

Although many aerodynamic data are needed for the proper design of a dirigible

<sup>1</sup>Abstract of an address before Section D—Mechanical Science and Engineering—American Association for the Advancement of Science, Baltimore, 1908.